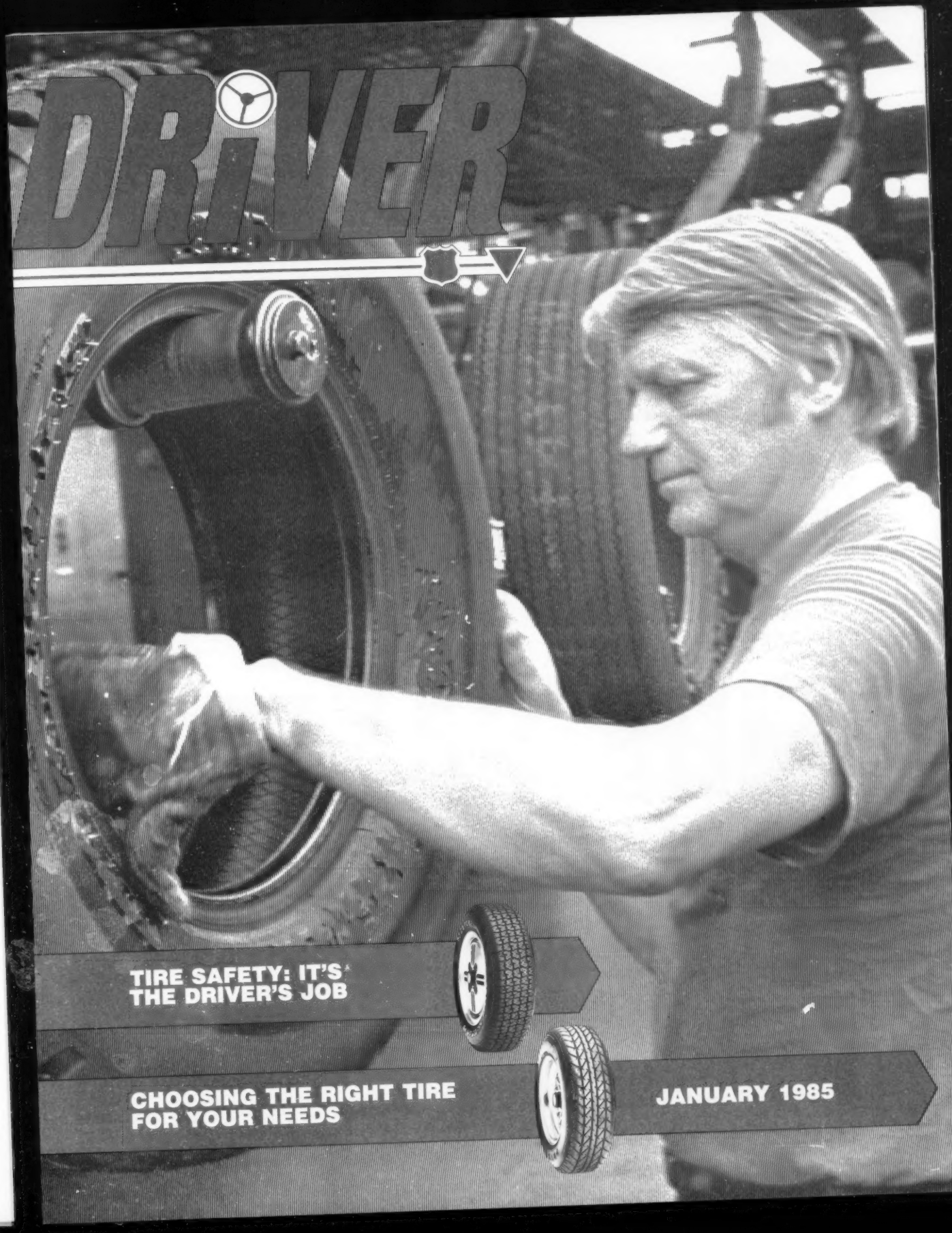
DRIVER
TIRE SAFETY: IT'S THE DRIVER'S JOB
CHOOSING THE RIGHT TIRE FOR YOUR NEEDS
JANUARY 1985

Before a tire reaches production it undergoes extensive tests such as these in Goodyear's Akron laboratory.

TIRE SAFETY:

Tires are also put through severe in-use tests such as these at Firestone's Rome International Test Center before they're approved for production.

In snowy areas, many cities and counties have "snow emergency" regulations. Under such rules, motorists usually are subject to fines if they don't have snow tires on their cars. You can avoid this by equipping your car with tires marked "mud and snow," or M/S on the sidewall.

It's the driver's job

"Despite what you may read and hear in tire company advertisements and commercials," confessed Kenneth J. Rapp, Semperit of America National Service manager, "the final arbiter of tire safety is the vehicle driver.

"Over the six decades of the pneumatic tire's existence, many 'legends' have come and gone about what to do and what not to do but, like most legends, the ones about tires are usually not true," continued Rapp. "In the forefront of the untrue (and dangerous) legends is the one that says to let air out of hot tires if the pressure is above the pressure stated on the tire's sidewall. However, the pressure on the sidewall is a maximum *cold* inflation pressure, not maximum pressure.

"The whole purpose and benefit of using pneumatic (gas-filled) tires is that they flex," noted Rapp. "This flexing smooths the ride and helps to protect the vehicle's components from shock damage. Flexing causes friction within the tire and that friction causes heat, both in the body of the tire and of the air inside the tire."

Do you know what happens to an underinflated tire as you go rolling happily down the road?

"First of all," William O'Connell, Dunlop Tire Service manager stressed, "it's starting to get hotter because it has to work harder than the other three tires; it has to flex many more times during each turn of the wheel. After a few miles it's really beginning to get hot and the cords inside the tire begin to age more rapidly, becoming weaker. You have a very 'tired' tire on your hands and eventually it's stressed beyond endurance — BANG! Another 'blowout' — another accident!"

"The tire itself is primarily a vessel to hold air," remarked Rapp. "The grip of the tire on the road is an incidental by-product."

"Oh," O'Connell added, "fancy patterns can be molded on the tread; nice white-walls can be put on the side, or maybe big macho letters. It can even be given a real catchy name, but somehow those things are not very important when you're suddenly fighting for your life,

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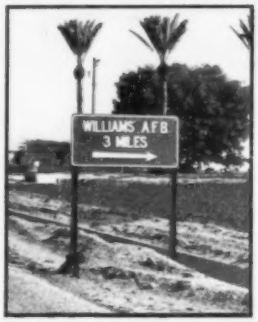

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continued

trying to control a three or four thousand pound vehicle moving at highway speeds — on only three tires."

"To carry a certain load, a certain amount of air must be kept in the tire," Rapp explained. "This amount of air is determined by the volume of air that the tire can hold as well as the air pressure. A large tire with low air pressure can carry the same weight as a smaller tire with high air pressure.

"Yet like everything else," he admitted, "there are limits.

"At the upper limit," Rapp reflected, "too much air pressure is bad for several reasons, mainly due to the absence of flex in the sidewalls: The ride becomes uncomfortable for passengers or rough on cargo, the suspension must do more work absorbing road shock and vibration (sometimes past its capacity). The tires become too stiff to properly absorb road shock and the danger of wheel and/or tire damage is increased. Too-high air pressure can cause the center of the tread to bulge out, or 'crown', and there is less tread in contact with the road surface.

"At the lower end, with too little air in the tire, the sidewalls flex too much. The body of the tire becomes too hot, often leading to sudden and catastrophic failure. The pressure will build because the air in the tire is heated but the heat can destroy the tire. Pieces of the tread or the entire tread can strip off. The sidewalls will crack and let air out suddenly.

"With low air pressure, rolling resistance increases and gas mileage decreases. The ride becomes soft and mushy, and controlling the vehicle becomes harder. As the vehicle bounces up and down, the center of gravity constantly changes, and handling and emergency maneuvers become much less precise.

"Even if the sudden blow-out doesn't happen immediately," the Semperit National Service manager observed, "there often is structural damage to the tire. This can most easily be seen when the tire is off the wheel. The inner liner is cracked and rippled, and usually a fine black dust can be seen inside the tire.

"Eventually, this damage will lead to tire failure. Failures due to underinflation are not covered by manufacturer's warranties and are very noticeable to knowledgeable tire people. Moreover,

continued

Ultimately tire safety is the driver's job.

When buying new tires, be sure your name, address and tire identification numbers are recorded and returned to the manufacturer or his representative. This tire registration enables the manufacturer to notify you in the event of a tire recall.

continued

Proper tire inflation makes tires wear longer, saves gasoline and helps prevent accidents.

Characteristic radial sidewall bulges make it virtually impossible to visually determine if a tire is properly inflated as shown in this example. The tire on the left is more than 48 percent underinflated. As a result it will run hotter, wear faster and/or unevenly, adversely affect vehicle handling, and may fail.

To keep tires properly inflated, you need your own tire pressure gauge — an accurate, hand-held pressure gauge. Tires should be checked when they are cold, ideally after they have been driven not more than one mile since resting at least three hours.

the higher heat in an underinflated tire makes the tread wear more quickly.

"All this happens to tires without enough air pressure in them; yet how often do you hear people talk about 'bleeding' air from the tires in the summer? Insufficient air pressure also lowers the speed at which a tire will aquaplane in the rain. There is a direct correlation between the speed at which a tire will aquaplane and air pressure."

Rapp declared, "Optimum air pressure is that which shows wear right up to the edge of the tread, usually about three pounds more pressure than recommended by the vehicle manufacturer, especially on passenger cars. The manufacturer wants you to drive out of the showroom with a smooth riding, comfortable car. The builder's air pressure recommendation is enough to hold the weight of the vehicle and avoid having customers complain to dealers about 'harshness,' but not enough for the real world."

You say you lost your owner's manual so you don't know how much air to put in? "Nonsense," exclaimed O'Connell, "look on the decal or placard that comes on your vehicle. It's usually on the driver's door or door frame. If you can't find that, look on the tire. It tells you what the maximum inflation pressure is right on the sidewall, and a little more air is certainly better than not enough."

Rapp reflected, "The air valve on a tire is not enough to keep the air in. The little cap is needed as the secondary pressure seal. Make sure all your tires have the caps on the valve stem. The valve itself should only be considered a primary seal.

"Sometimes, when people buy new tires, they go back to the dealer complaining about losing air. Usually, that happens because the valve stems are 'worn-out' too. Not really worn-out, but dried out after exposure to sunlight, ozone and other contaminants in the atmosphere. It's a good practice to pay the extra few dollars for new valves when buying new tires.

"In the same respect," Rapp continued, "if you use tube-type tires, it makes good sense to replace the tubes when you buy new tires. Tubes replace the tire body in tubeless tires as a pressure vessel.

"They stretch a certain amount to conform to the shape of the tire-wheel assembly in which they are mounted. A tube that is undersized stretches too much. The rubber in the tube thins as it stretches and no longer is air-tight. The air molecules can pass right through the thin rubber of the tube. With a tube that is too large, the rubber may not stretch enough and it may wrinkle. The wrinkle, or folded, area of the tube may have enough rubber in it to put the tire out of balance. The wrinkle also can get abraded by rubbing within the tire carcass, leading to loss of air."

Rapp admitted, "Even when everything is perfect, air leaks out of a tire. Even variations in air temperature affect tire pressure; by one pound per 10 de-

grees (Fahrenheit) change. A 32 pound air pressure at 85 degrees will be 27 psi (pounds per square inch) at 35 degrees.

"Tire pressure should be checked regularly with an accurate gauge; built-in gauges at service station pumps are rarely accurate."

Donald G. Brotzman, Tire Industry Safety Council chairman, confirmed Rapp's advice when he said "Tire air pressure should be checked at least once a month and before long trips. Use your own tire pressure gauge because air towers at service stations are often inaccurate due to exposure and abuse."

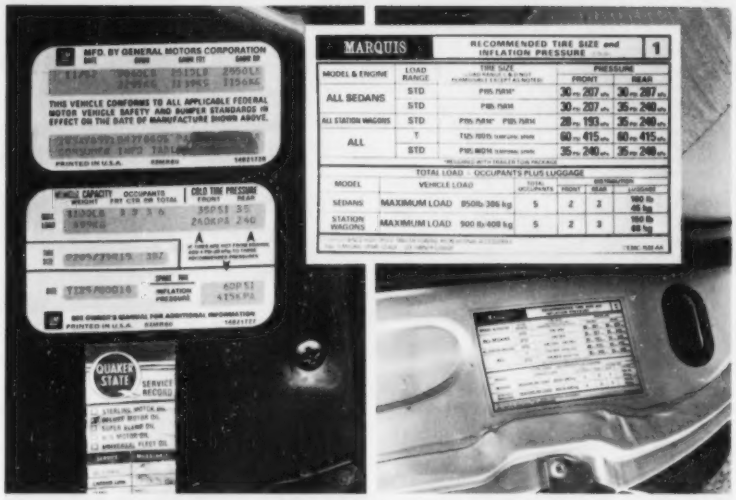
The American Automobile Association even recommended that motorists who are accustomed to pumping their own gas and cleaning their own windshields make each fourth stop at a full service gasoline station rather than self-service. Then the driver should make sure the attendant checks the tires, oil, battery, window washer well, wiper blades and lights.

The Tire Industry Safety Council chairman expressed concern about people letting air out of their tires in an attempt to get more traction on snow, ice or in mud. Brotzman cautioned, "excessive heat from underinflation can damage tires."

"For best traction in the snow, higher air pressure is better than low," the Semperit service manager announced. "So are narrower tires. The effect we are reaching for here is to increase the downforce of the tread. The tire will go down into the snow, through the soft surface layer and get a better grip on the harder pack underneath. The wider the tire (and lower the air pressure), the more the tendency of the tire to 'float' on the surface of the snow. In Europe, many drivers remove their super-wide performance tires for winter use and put on the narrowest section tires they can.

"Even though it may sound like tire maker's baloney," Rapp said, "four snow tires are more than twice as good as two. Four snow tires enhance the balance of a car's handling, front-wheel-drive or rear-wheel-drive. With four snow tires, braking, starting and steering forces are closer to each other and your safety margin is increased."

Brotzman said that if you have radials on the car already, you should use radial snow tires or radial all-season tires marked M/S or "Mud & Snow." "It's hazardous to drive with radial tires on the front axle and other type tires on the rear regardless of whether it's a front- or rear-



The proper amount of air (or inflation pressure) for your tires is the number of pounds-per-square-inch (psi) specified by the vehicle manufacturer for the front and rear tires on your particular model car. You can find this correct air pressure on the tire placard, or sticker, in the vehicle. It is permanently affixed to the glove compartment door, or on the edge of a car door, or on the door jamb surface.

What type of tires are available for use in snow country? According to BFGoodrich, where snowfall is light drivers can generally get adequate performance from regular highway or conventional radial passenger tires. Because of the flexible sidewall and rigid belt construction of the radial, tread motion is reduced, which allows more constant tread contact on the road. This increased contact results in increased traction. If moderate snowfall, slush and wet conditions are the norm in your area, you may choose an all-season type tire. All-season tires are growing rapidly in popularity and feature a design mix of mud and snow tire elements and conventional highway tire performance. In short, the tread design elements have been opened — made more aggressive — to provide better winter traction and self-cleaning capabilities. Drivers in very heavy snow areas should consider using traditional mud and snow tires. These tires are designed for one purpose only — traction during heavy snow or mud conditions. Because of their open design, it is recommended that they be removed after the winter season. The heavy lug design of winter snow tires creates excessive heat build-up during the warm months causing them to wear at a faster rate.

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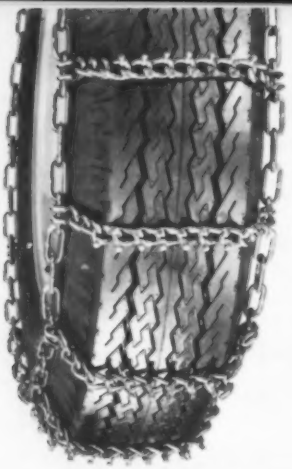


If you use chains, make sure they are the proper size for your tires.

tire safety: it's the driver's job

continued

wheel-drive vehicle," he cautioned.

"On wet, snowy, or icy surfaces, everything is exaggerated," Rapp observed. "Any changes you make in the vehicle's attitude (steering input, braking, accelerating) become magnified. Making changes slowly and gradually is most important in winter driving conditions."

Repeating Rapp's advice, Brotzman added some other winter driving tips:

■ Don't make sudden turns if you suspect the roadway is slippery. Make smooth, gradual changes, being careful not to oversteer. To prevent slipping, pump rapidly but lightly on your brakes to gradually slow your car. If you begin to slide, steer in the direction of the skid, with your foot off the brake pedal until you feel you are in control.

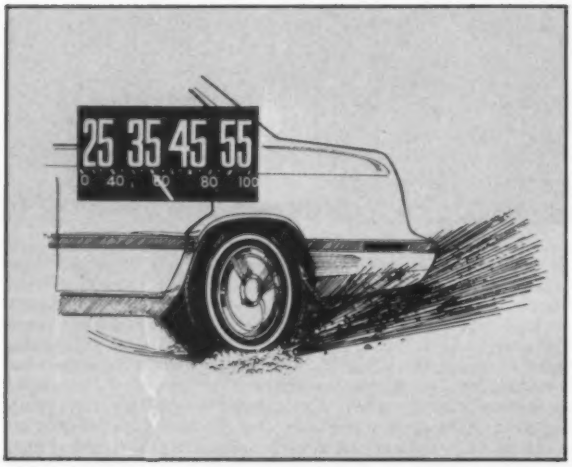
■ If one of the drive wheels becomes stuck, never race the engine because the free-spinning wheel will spin at twice the speedometer reading. This develops tremendous centrifugal force which could cause the tire to explode or disintegrate.

Where local laws allow, Rapp said, "Whether you use studded tires or not is a question that is best answered on an individual basis, but if studs are used there are some important things to know about them. Studded snow tires make the most improvement on hardpacked snow surfaces. On glare ice, not much will work besides chains and caution. Studs are marginally helpful on soft snow.

"On dry or wet surfaces, studs can feel like non-studded tires on ice, as the contact between rubber and road becomes contact between rubber, metal and road."

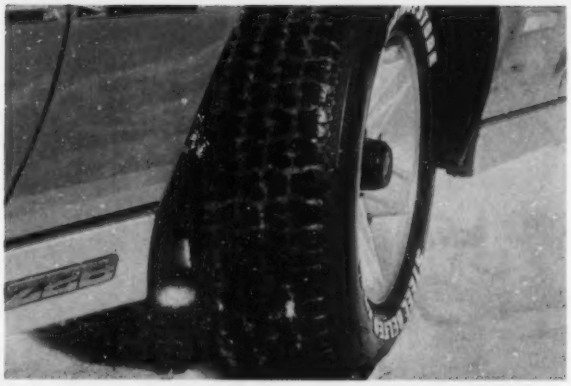
The Semperit service manager warned, "Studs should not be inserted into used tires. The stud-holes may have picked up little pieces of rock, sand and other road debris and the act of inserting the studs

The first few minutes of a spring or summer rainstorm can spell danger for the unprepared motorist. As rain water hits the roadway, it forces grease and oil to the surface, creating a thin, slippery film which is almost as slick as ice. This greasy film acts as a lubricant between your tires and the roadway, seriously reducing traction even if your tires are new. Another driving hazard is created when a hard rainstorm causes water to accumulate on the pavement, increasing the chances of your tires "hydroplaning" or "surfboarding" at higher speeds, particularly more than 40 mph. This, too, results in loss of traction and consequently loss of vehicle control. Additionally, stopping on a wet road can take up to four times the distance needed on a dry road.



When one wheel is stuck and the other is not, the free wheel turns at twice the speedometer reading. (In our example, the speedometer reading of 35 mph means the free tire is spinning at 70 mph.) Extreme centrifugal force is at work here and an explosion can result in vehicle damage, personal injury, or death.

Even weather affects tire inflation pressures. When temperature changes occur, tire inflation pressure will also change. Each drop of 10 degrees F. will cause a corresponding drop of one psi in inflation pressure.



When you put new tires on your car you should check them in a controlled environment to get an idea of how they'll perform in an emergency situation. This is especially important when dealing with snow.

can push the debris into the tire carcass.

"Studs will lose their effectiveness after three winters or so. After that, they merely make noise and they can't be replaced; by the time the studs are worn, so are the tires and there is not enough tread to hold the studs in place. Also, since the tread is lower, the studs may puncture or damage the carcass as they are inserted into a used tire.

"On front-wheel-drive vehicles, use either four studded snow tires or no studded snow tires," Rapp urged. "A front-wheel-drive vehicle with studs only on the front wheels will have a very strong tendency to break away in the rear. The result is not an embarrassing skid but a dangerous and uncontrollable spin-out!

"On rear-wheel-drive vehicles, studded tires only on the rear are acceptable but studded tires on the front also will help in steering and braking."

So why do tires skid?

According to Rapp, "Your tires can only handle so much. Assuming that a tire can handle a total input of 100 percent, 50 percent can be steering and 50 percent can be braking. When the input exceeds 100 percent, the tire loses its grip and you're skidding.

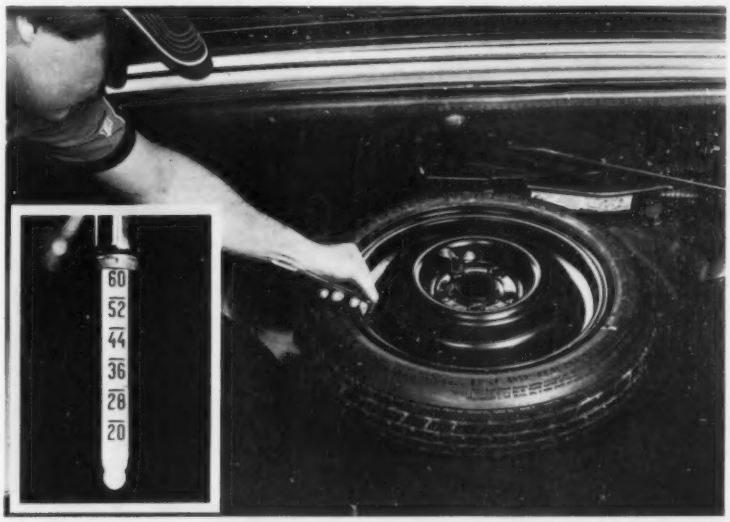
"When that happens, you've got to decrease the load on the tires, either by reducing the steering angle or reducing the amount of braking force. Usually in a skidding situation, steering is what is needed most. The best choice is to ease up on the brake and steer into the skid.

"I always test new tires so I have an idea of what they'll do in an emergency situation," explained Rapp. "The test also gives me an idea of what I should do and how the car feels and reacts.

"As an example of such a test, the first snow of the year finds me in an empty parking lot. I'll get the car up to speed, then see how it works when braking. I'll put the car into a skid and practice getting out of the skid. I always make sure there's plenty of space between me and any lightpoles, signs, etc.

"This is a good idea with new summer tires too," concluded Rapp. "See how they differ from what you've become accustomed to. Prepared that way, if something sudden comes up, you'll know what you can expect of your car and tires."

No matter who you talk to about tire safety — Armstrong, Bridgestone, Cooper, Dayton, Denman, Dunlop, Firestone, General, BFGoodrich, Goodyear, Kelly-Springfield, Lee, McCreary, Michelin, Mohawk, Semperit or Uniroyal — the bottom line is always going to be the same: It's the driver's job. Or, as the Dunlop service manager put it, " 'To air is human' and a tire cannot forgive. It is the clear responsibility of each and every one of us to keep our tires supplied with life sustaining air."



To Insure that the temporary spare is ready when needed, a monthly inflation pressure check is recommended. Unlike standard size tires, most temporary spares require inflation pressures of 60 psi, about double the pressure of standard sized tires. Since most handheld air pressure gauges are graduated only up to 48 psi. motorists would be well advised to ask a qualified tire service professional to conduct regular inflation pressure checks. When using a temporary spare tire, you should remember that the temporary spare tire in *your* trunk was specifically designed for use on *your* car. For this reason it should never be used on another vehicle.

CHOOSING THE RIGHT TIRE for your NEEDS

How often do you think about your tires? Probably about as often as you change the lightbulbs in the family room. Statistics compiled recently by the BFGoodrich Tire Group indicate most American consumers pay very little attention to the tires on their cars. If, as the study suggests, motorists don't pay much attention to the tires already on their cars, how much do they know about the tires they are buying?

The tire selection process has become more complex over the years. Tire buyers had basically one purchasing choice, the bias ply tire, until 1965 when the European-developed radial was introduced into the United States. The radial tire offered advanced technology and differed from the basic bias ply construction in the angle of the body ply cords. In radial tires, the cords run across the tire from bead to bead at a 90-degree angle to the direction of travel. Today, all American-made cars come equipped with radial tires.

Bias ply tires, still available today, are constructed with two, four or more plies — or layers of fabric — with the cord in the individual plies running in a diagonal,

All tires look much the same from the outside. In fact, the major external feature distinguishing most tires is the pattern of their treads. On the inside, it is different.

bias direction. Bias ply tires required the use of tubes until 1947 when the first commercial tubeless automobile tires were introduced.

American consumers were offered another tire buying choice in 1966 when the belted bias tire was introduced to the marketplace. The belted bias tire incorporated the basic bias ply construction, but added two or more reinforcing belts under the tread. It was this tire that replaced the bias ply tire as original equipment on American cars. The changeover was virtually complete in 1969. Later, in the early to mid-seventies, the radial replaced the belted bias as either standard original equipment, or as an extra cost option on U.S. cars.

Adding to the complexities of the tire selection process is that all three basic types of tires are produced using various types of materials. Bias ply tires are manufactured with cords of polyester, nylon or rayon. Belted bias tires have polyester and nylon cords used with fiberglass, rayon or steel belts. And radial tires are produced with cords of polyester, nylon or rayon, used in com-

continued

choosing the right tire

continued

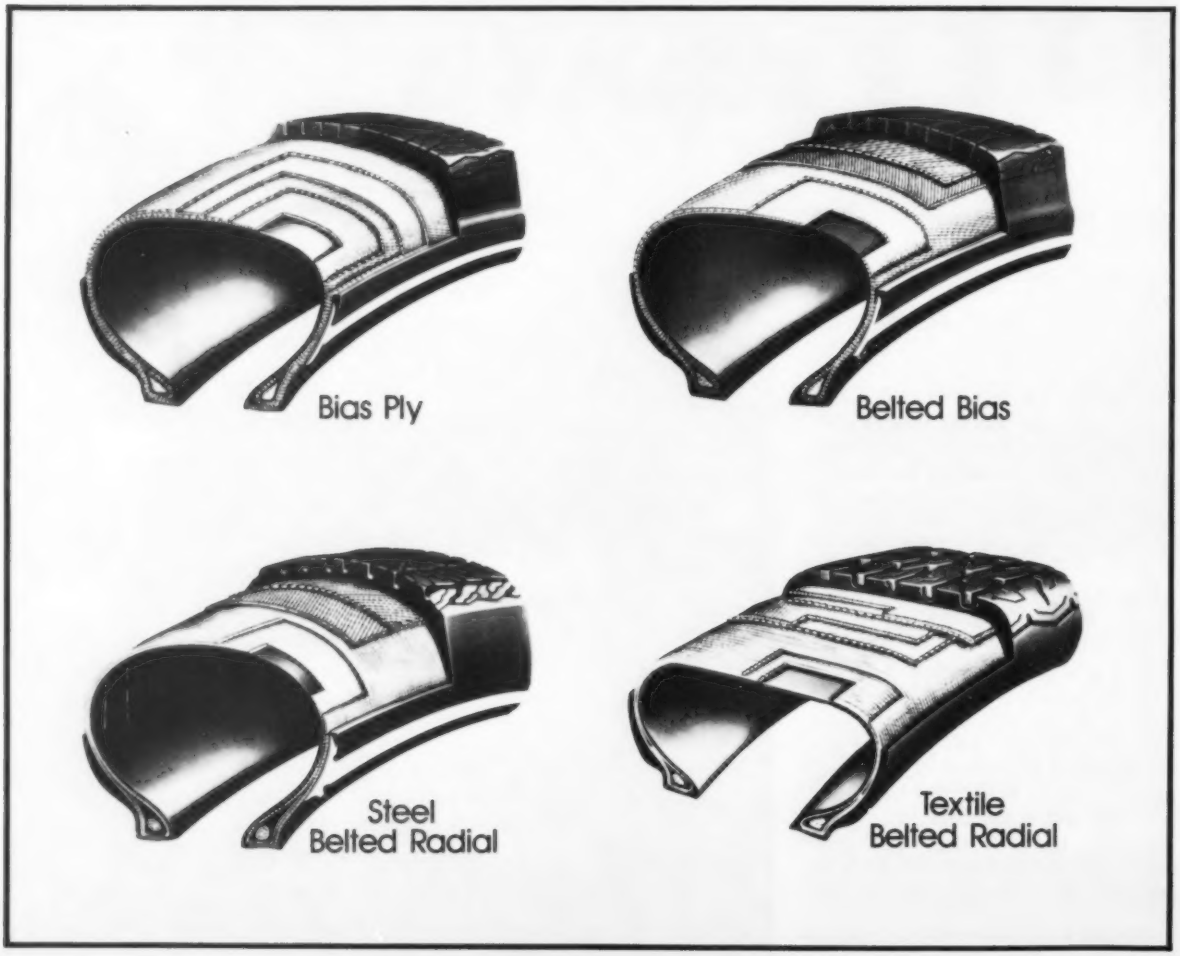
bination with belts made of steel, fiberglass, rayon or aramid.

Further complicating the picture is that varying numbers of these tires are sold in the United States under more than 130 brand names.

Adding all of this together would seem to make tire selection extremely difficult. But it doesn't have to be.

The first thing the tire-buying consumer should do is go back to the basics. Examine the three basic types of tire construction and determine how each will meet your needs — from a performance point of view as well as cost effectiveness. Let's look at each type more closely.

(below)
Understanding the basic types of tire construction will help you make the proper selection for your vehicle. According to the BFGoodrich Tire Group, a bias ply tire (upper left) provides good ride quality, but the absence of stabilizing belts under the tread permits tread motion during road contact. A belted bias tire (upper right) has a construction basically the same as a bias ply tire except that belts have been added. The belts, commonly two-ply, run the circumference of the tire just under the tread. The belts add strength and reduce tread motion, thus providing greater stability and improved tread life. The steel belted radial (lower left) provides outstanding strength, long mileage and increased puncture resistance. The four-ply, low-angle belts strengthen the textile belted radial (lower right), and reduce tread motion. Combined with a flexible sidewall, the textile belted radial gives excellent mileage, handling and overall performance.



BIAS PLY: The bias ply tire, the least expensive to purchase, offers good quality at an attractive price. While it doesn't offer all of the performance characteristics built into its more technically advanced successors (the radial and belted bias tires), the bias ply tire has a proven track record.

BELTED BIAS: The belted bias tire is similar to a bias tire, but is constructed with two or more "belts" under the tread. This feature provides extra strength and greater stability to the tread area. The belts reduce tread motion during contact with the road, which diminishes heat generation and improves tread life. The extra layers provided by the belts also lessen the chance for impact breaks. More technically advanced than the bias ply tire, the belted bias tire is more complex to manufacture. It is more expensive to purchase than the bias ply tire and shares the same distinction of having a proven in-use record.

RADIAL: The radial ply tire represents state-of-the-art technology in the craft of tire building. A tire of this construction is the most expensive of the three to purchase, but offers a good return on the money invested. Treadlife is greater than that of its predecessors, and the performance characteristics of a radial tire are widely recognized. Tire body cords extend across the tire from bead to bead at a 90-degree angle to the direction of travel. The belt plies run circumferentially under the tread. They constrict the radial ply cords and give rigidity to the tread. This type of construction gives greater strength to the tread area and flexibility to the sidewall. You can expect the radial construction to offer significant improvements in important performance areas such as tread life, traction and handling.

In addition to basic knowledge of tire construction, it is also important to keep the following tips in mind when selecting new tires:

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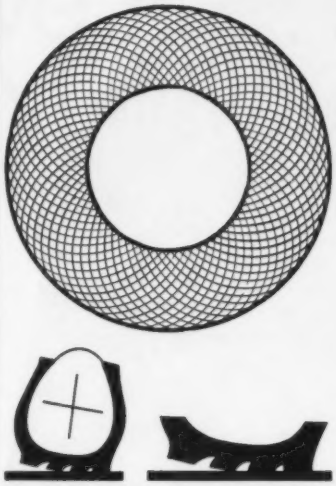
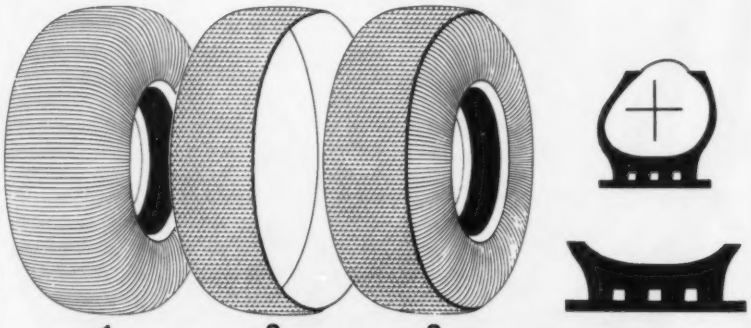


The cross-ply tire

Cross-ply or conventional tires have a number of plies which are laid obliquely, criss-crossing one another. As the tire revolves and deflects, these crossed plies interact and generate heat—a process which prematurely ages the constituents and shortens the life of the tire.

The number of cross-plies in a conventional tire tends to stiffen its walls, preventing sufficient flex under heavy load. This causes lateral tread movement which impairs road grip and causes tread abrasion.



The Michelin "X" radial

1. The cords in the casing of the "X" are laid radially, a design feature that makes the tire's walls extremely flexible. These supple walls "give" under load, absorbing uneveness in the road surface. The "X," therefore, introduced a new era in driving comfort.
2. Another "X" innovation is the belt of steel-cord plies around the steel-cord casing that braces and stabilizes the tread, improving contact between vehicle and road and reducing unwanted movement in the tread-road contact area.
3. In other words, the two major features of the "X"—its radial walls and tread bracing belt—perform their functions quasi-independently.

continued

Considered to be the first major tire technology innovation since the birth of the radial in 1948, Armstrong's Assurance tire with its Tredloc interwoven belting system recently received an award for achievement in product safety in a program co-sponsored by the National Safety Council and the National Association of Professional Insurance Agents. Because the Tredloc belt has a unique, woven, endless and interlocked construction, it minimizes internal tire forces and strengthens the tire at the belt edge area. It virtually eliminates tire failures due to belt-edge separation, the most common cause of radial tire problems. The U.S. Office of Consumer Affairs also singled out the tire for its 55,000-mile limited warranty package as "a significant contribution to consumers."

■ Tires should be replaced with the same size designation, or approved options, as recommended by the automobile or tire manufacturer. Never choose a smaller size than those which are specified for the car. However, it is not always possible to replace a tire with exactly the same size. If a tire size other than the one shown on the vehicle placard (located in the glove box, on the door edge or door jamb) must be used, ask a qualified tire specialist for advice.

■ Avoid mixing different types of tires on your car. Radial tires incorrectly mixed with bias or belted bias tires can seriously affect handling ability and vehicle control. Above all, never mix tires of different constructions or sizes on the same axle, except for limited use of a temporary spare tire.

■ Snow tires should be mounted on the drive axle (whether front or rear), or on all four wheel positions if desired. If you change to snow tires, be sure the snow tires are the same size and construction as the other tires on your car. Never put bias or belted bias snow tires on the rear if you have radials on the front. On front-wheel-drive cars, snow tires go on the front — the driving axle.

■ If you are purchasing only a pair of replacement tires in the same size and construction as those on the car, put the two new tires on the same axle.

■ If you are purchasing only a single new tire, it should be paired on an axle with the tire having the most tread depth of the other three.

■ When two radial ply tires must be used with two belted bias or bias ply tires, the radials always must be placed on the rear axle. Otherwise the car may be difficult to handle, possibly causing a serious accident.

While this information should be helpful in making tire selection decisions, the best possible advice is to go to your local tire store. They have the knowledge and experience to evaluate your particular needs. Their business depends on satisfying your requirements.

Regular Tire Inspection Can Save Your Life As Well As Your Money

There is a very close working relationship between your tires and several mechanical systems in your car. Tires, wheels, brakes, ball joints, shock absorbers and suspension systems must all be functioning smoothly to give you a comfortable, safe ride.

BFGoodrich suggests that you conduct a mini inspection tour around your car at least once a month. Check the inflation pressure in your tires when they are cold, ideally before the vehicle is moved. Driving the car for even a short distance will create heat build-up and cause air pressure to increase. Again, check air pressure before the car is driven and note the amount of underinflation for each tire. Then add that amount of air when you reach a nearby service station, using your personal hand-held pressure gauge as a check. Cold pressure cannot be determined from a hot tire. And don't forget to check your spare tire!

Then example your tires, checking closely for signs of uneven wear. That usually means trouble of some kind. If you catch the problem in time, the cause often can be corrected at a local tire service facility. Taking early action will extend the life of your tires.

Uneven wear patterns may be caused by improper inflation pressure, misalignment, incorrect balance or suspension neglect. If not corrected, further damage to your tires will occur.

The next time you stop for gasoline, take a look at your tire tread. If the tread is less than 1/16th of an inch deep, you're inviting trouble. Government studies show that the risk for tire failure and loss of vehicle control rises sharply when tires have less than 1/16th of an inch of tread remaining.

Today's tires have built-in tread wear indicators, or "wear bars," which will appear at several points around the tire when the tread depth reaches the danger line of 1/16th of an inch. These wear bars look like narrow strips of smooth rubber across the tread. When you see the wear bars, the tires are worn out and should be replaced.

While you're checking the tread, remove any bits of glass, metal or other foreign objects which are wedged in the tread; otherwise, they may work deeper into the tire, causing a flat. If any tire continually needs more air than the

continued

continued

Today's tires have built-in tread wear indicators, or "wear bars," which will appear at several points around the tire when the tread depth reaches the danger line of 1/16th of an inch. These wear bars look like narrow strips of smooth rubber across the tread (note arrows pointing to wear bars). When you see the wear bars, the tires should be replaced.

To use a tread depth gauge, simply insert it in the tread grooves with your index finger and middle finger applied lightly to the wings on the gauge. The gauge core will recess into the groove, which in turn will push the graduated scale outward. If the tread depth readout scale is less than 1/16th of an inch deep, you're inviting trouble.

During routine tire inspections take a moment to check the condition of tire valves and valve caps. Check the valve stem for cracks, cuts and scrapes. If the valve stem is suspect, it may be leaking air and should be replaced. It is recommended that a new tire valve be installed whenever a tire is replaced. Make certain also that each valve requiring a valve cap does, in fact, have a cap. The cap has a very special purpose and should be replaced if missing. Valve caps keep out dirt and moisture and prevent an accidental depression of the valve core and loss of air.

others, have it taken off the car by a tire service professional and checked to find out why it's leaking.

If your car pulls to the left or right, or your tires show uneven tread wear, your wheels may be out of alignment. Improper alignment can make your tire/wheel assembly turn in or turn out too much. Or, your tire/wheel assembly could be improperly tilted to the road surface. Drive a badly misaligned car on one long trip and you can virtually ruin a set of good tires. One bad pothole may be enough to throw your car's front end out of alignment, even if you had it fixed an hour earlier. One bump can even dent a wheel rim, causing a loss of air pressure. If the problem is diagnosed as misalignment, be certain to take your car to a qualified professional for corrective measures.

Out of balance tire/wheel assemblies also can ruin tires and give your car the shakes. An assembly seriously out of balance will develop a disturbing pounding at highway speeds, and you may experience a noticeable vibration in your

If your car pulls to the left or the right, or your tires show uneven tread wear, your vehicle may be out of alignment. If the problem is diagnosed as misalignment, be certain to take your car to a qualified tire professional for corrective measures.

Dynamic (or spin) balancing is the preferred method because it takes into account both the radial and lateral imbalance.

steering wheel. When this happens, the tire/wheel assembly should be rebalanced by a tire service professional.

Any time you elect to change tires, the tire/wheel assembly should be balanced. The same is true if you notice that one of the balance weights has come off the assembly. Dynamic (or spin) balancing is the preferred method because it takes into account both the radial and lateral imbalances.

During your tire inspection, take a moment to check the condition of tire valves and valve caps. Check the valve stem for cracks, cuts and scrapes. If the valve stem is suspect, it may be leaking air and should be replaced. It is recommended that a new tire valve be installed each time a tire is replaced. Make certain, also, that each valve requiring a valve cap does, in fact, have one. The cap has a very special purpose and should be replaced if missing. Valve caps keep out dirt and moisture, and prevent an accidental depression of the valve core and loss of air.

A valve stem can be damaged by improperly replacing a wheel cover. If the valve stem is not centered in the wheel cover hole, the edge of the hole acts like a knife vibrating against the stem. Eventually it could cut through the stem, resulting in a sudden loss of air. If you notice this condition, remove the wheel cover and place the cover hole over the valve in proper fashion.

Rims, or wheels, should also receive a routine inspection. A defective rim can leak air and create a potentially hazardous situation. A bent rim is a common occurrence caused by hitting a pothole or other obstacle. A rim in this condition can cause air leaks between the rim and the tire bead and can upset the dynamic balance of the tire and wheel assembly, causing a vibration. It also could cause the wheel to rub on the disc brake caliper housing resulting in a build up of heat in the wheel and explosive failure of the tire.

A rim that is rusty near the tire bead area can set up a chafing action during flexing, which can lead to air leaks and/or tire failure in the bead area. Rims also can be out of tolerance. An over tolerance diameter rim can create a problem in mounting, such as bead breakage, while a loose tolerance diameter can result in possible loss of air and bead failure. If you detect a possible problem, have the rim checked by a qualified tire professional.

If during your inspection you notice that you have picked up a nail in one of your tires, don't remove it. Leave it in for a tire service professional to remove so he can note the location and size of the injury. You should remove the damaged tire and replace it with the spare tire until the repair can be made. (Your best bet in an emergency is a good spare tire, properly inflated.) Never permit a tire to be repaired if the tread puncture is larger than a quarter of an inch. In all cases, motorists are strongly cautioned against repairing or mounting their own tires, due to safety hazards involved. This is a job for trained service personnel. Overinflation may break a bead, or even the rim, with explosive force, causing serious personal injury.

Although they may not be in the same league as Shakespeare, Dickens, Melville or Hemingway, the tires on your car do, believe it or not, have much to offer in terms of good reading. Sound silly? Not when you consider that the average tire has nearly 20 pieces of relevant information printed on its sidewall.

Reading a tire's sidewall may not be your idea of the best way to spend a winter evening — they don't exactly fit comfortably into an easy chair near the fireplace as does a copy of *War and Peace* — but they do contain useful information.

By way of example, let's take a look at this illustration of a tire. The drawing shows letters, codes and warnings on the sidewall of the new generation all-season radial tire:

1. Manufacturer

2. Size designation. 'P' refers to the fact that it is a passenger tire; '185' refers to the tire's width in millimeters; '80' is the tire's "aspect ratio" — its height from the rim to the tread surface — in this case 80 percent of the tire's width; 'R' means the tire is a radial design; and '13' represents the rim diameter the tire fits.

3. M+S. This means the tire meets the Tire and Rim Association's definition of a mud and snow tire.

4. The manufacturer's registered tire brand name.

5. Safety warning. This wording, agreed upon by the Tire and Rim Association and the tire industry, is designed to alert you to what could happen if guidelines governing overloading and underinflation are not followed.

6. Uniform Tire Quality Grading (UTQG) system. Although the regulations requiring this rating have been pulled, there is still a court battle going over its nonuse. The ratings by the National Highway Traffic Safety Administration were designed to help consumers determine the quality of tires based on tread wear, traction and temperature tests on a government-specified test track. The treadwear rating of 240 translates into a tread life expectancy of 72,000 miles on the government-specified course, with a base 100 rating at 30,000 miles. The B wet traction rating on a scale of A, B and C (A being best) measures braking force at 40 mph on concrete and asphalt surfaces. The C temperature rating relates

to heat resistance level measurements on a flywheel (again on an A, B, C scale, with A being the best). The C rating indicates the minimum levels all passenger tires must pass for a prescribed distance at 85 mph.

7. Generic name for the materials that make up the tire's carcass plys — casing construction.

8. Denotes the material of which the belts are made. These belts are placed in the tire below the tread area.

9. Tread 3 Ply. This designation relates to the tire's construction, with one polyester ply in the carcass and two steel belts below the tread surface.

10. Sidewall 1 Ply. Refers to the one layer of polyester cord that makes up the sidewall of the tire.

11. Standard Load. This denotes the fact that the tire is of the "Standard" load type most common in passenger tires. The load range varies depending on the size of the tire.

12. Max Load. This designation relates to the maximum load per wheel the tire can safely accommodate. For this tire, it is 590 kilograms or 1,301 pounds per tire.

13. Max Infl. Refers to the tire's maximum inflation pressure when cold. That is, when the tire has not been in use. For this tire, maximum inflation translates to 35 pounds per square inch.

14. Manufacturer's mold type designation for internal inventory purposes.

15. Manufacturer's mold serial number for internal inventory purposes.

16. Size designation of the tire.

17. Denotes the fact that the tire is of radial design and construction, as opposed to bias design and construction.

18. Refers to the fact that the tire does not require a tube inside of the carcass.

Additional information can be found on the back side of most tires. However, it often duplicates what is on the tire's curb side or is used by the manufacturer for mold designation and inventory purposes.

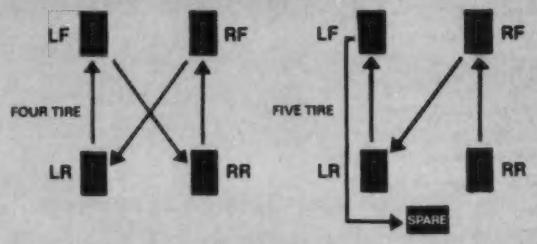
Obviously, there's a great deal of information on the sidewalls of a tire. Although it may not pose a serious threat to our literary masters this information does, nonetheless, tell you a great deal about the capabilities, type and quality of the tire.

Good driving and good reading!

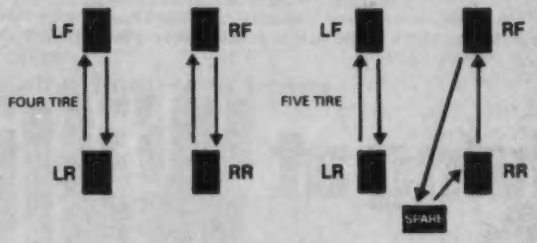
TIRE ROTATION PATTERNS & FOR PASSENGER CARS LIGHT TRUCKS

TIRE ROTATION PATTERNS

Two basic patterns may be used:



1. "X" Rotation Pattern



2. Front-to-Rear Rotation Pattern

Front and rear tires perform different jobs and can wear differently depending on the types of roads driven, driver habits, vehicle types, etc. For longer tire life, tires should be inspected and rotated as recommended in the vehicle owner's manual or maintenance schedule folder.

Uniroyal recommends its tires be rotated the first time between 6,000 to 8,000 miles and at similar intervals thereafter. The timeliness of the first rotation is very important and should you observe any indication of irregular or uneven wear the rotation should be performed at an earlier mileage than the general recommendations.

Uneven or abnormal tire wear is usually caused by incorrect inflation pressures, improper wheel alignment, out-of-balance tires, or poor driving habits. Lack of regular rotation will magnify the degree of abnormal wear. Before rotating tires, determine the cause of any unusual wear, correct any misalignment, imbalance or other mechanical problem.

There are two basic tire rotation patterns: the "X" and the "Front-to-Rear."

Traditionally, the "X" pattern was recommended for bias and bias belted tires. The "front-to-rear" was for radial tires. The reason for using the front-to-rear pattern for radial tires was the belief that reversing the direction the tire rolled in could cause objectionable ride disturbances. With today's modern radial tires, Uniroyal found this problem virtually non-existent.

The best rotation pattern is the one that results in the most uniform wear for *your* vehicle. Of course, your tire wear patterns will depend on your vehicle, driving habits, road conditions, as well as numerous other facts.

Do not include "temporary use only" spare tires in any rotation.

After rotation, adjust the front and rear tire pressures according to the tires' new locations.

Meanwhile, Goodyear tests have shown that rotating front-wheel-drive car tires front-to-rear at regular intervals actually wears the tires out faster. As a result, Goodyear advises against rotating the tires on front-wheel-drive vehicles unless excessive irregular wear patterns develop.

Country roads around Williams AFB are frequently resurfaced due to heavy farm machinery usage. Motorists should be aware of the lack of striping, loose gravel and soft shoulders.

Driving at Williams AFB

by SSgt. GARY CUNNINGHAM
Williams Air Force Base, Arizona
USAF photos by David Elms

"One of the best kept secrets in the U.S. Air Force," is a comment often made by airmen stationed at Williams Air Force Base. Located in the heart of Arizona's central desert region, known as the Valley of the Sun, outdoor buffs find themselves within a few hours drive of a mecca of recreational opportunities.

Williams lies 30 miles southeast of Phoenix, and eight miles due east of Chandler, offering the advantages of being within easy commuting distance of a major metropolitan area, yet far enough removed to allow ample elbow room.

Driving in the Valley of the Sun, though, can be hazardous to the uninformed and unsuspecting motorist. A trip to Phoenix, or other parts of the valley, will require the driver to rapidly adjust to changing road conditions and traffic situations, such as country, city, residential and industrial. Also, as in other states, weather plays a big part in safely negotiating the highways and byways of central Arizona.

Beginning with the base access roads, newcomers find that there is only one way in and out of Williams. Williams Field Road ends right at the main gate, approximately 15 miles east of its beginning at Interstate 10. The road is heavily traveled, with speed limits varying because of several small communities, the largest of which is Chandler. Speeding and loss of control account for most of the mishaps on this straight stretch of road bordered mostly by irrigation ditches and cotton fields. Another factor to consider is that because of the east-west direction of Williams Field, the sun causes poor visibility on the way to work each morning and again in the afternoon. A good sunvisor in your vehicle and a quality pair of sunglasses are a must.

Actually, the bright sunshine of the valley that attracts thousands of tourists each year is a major contributor to traffic accidents. The vast majority of roads off-base are laid out in an east-west/north-south configuration. Drivers must always take the position of the sun into account.

The scene of several mishaps for motorists is the intersection of Williams Field Road and Power Road, approximately 200 yards from the gate. While there have been no fatalities yet, the potential for danger remains high. All of the accidents here are due to the fact that one operator tries to beat the light, and the driver travelling in a different direction refuses to allow that. Once again, with everyone entering or leaving the base having to negotiate this intersection, early morning and late afternoons are especially hazardous times.

Arid deserts mixed with a complex system of irrigated fields supporting a wide variety of agriculture have long made up the terrain surrounding Williams, but all of that is changing rapidly. Expansion and development of the base's nearest neighbors — Chandler, Gilbert and Mesa — are creating a multitude of driving hazards in the southeast valley. Housing developments are being built, industry is moving in, roads are being widened, power and sewage services are being installed and irrigation systems are expanding to keep up with the growth.

Compounding the problems of encroaching civilization are the driving

hazards of old: loose cattle, horses or sheep, and slow-moving, unlighted farm equipment. Suffice it to say it is not uncommon to find yourself in a traffic jam near Williams due to any of the previously mentioned conditions, but planning ahead, staying alert and driving defensively will see you safely to your destination.

WEATHER CONDITIONS

Ideal temperatures most of the year, limited rainfall, an abundance of sunshine and a total lack of ice and snow in the valley are the primary reasons for tourism being the primary industry in the state. However, there are a few clouds behind this silver lining.

The complex irrigation system in the Valley of the Sun has turned the central Arizona desert into a lush agricultural area, but the deep concrete ditches (right) that parallel many of the roadways pose a danger to motorists who stray from the paved surfaces.

This is the sixth in a series of articles about driving conditions at Air Training Command bases.

The area averages only about seven and one-half inches of rainfall per year, but most of this falls in sudden, heavy thunderstorms, often producing flash floods. Flash floods in desert areas occur mainly in the more mountainous parts of Arizona, but the raging torrent may move for many miles into relatively flat terrain. The violent rushing of water collects debris and mud, becoming destructive to everything in its path. Highway officials have posted flash flood warning signs in the high risk areas of the state. These should not be ignored, especially if there have been rains in the area recently.

If you are caught in heavy rainstorms while traveling in and around the local area, use the car radio to keep alert to weather conditions. Remember, when it rains the accumulation of dust, oil and water creates an extremely slick surface.

On the road, look for flooding in highway dips, bridges and low areas. If your car is damaged or stalled, stay near it on high ground. Search and rescue parties will locate a vehicle more quickly than a person.

The sudden, blinding fury of a dust storm must also be taken into account. They can be expected especially during the afternoons of Arizona's long, hot summer days when thunderhead clouds are seen.

continued

Children rushing to and from school are not always mindful of traffic. Drivers passing through local communities must keep in mind that the youngsters have the right of way.

With all of the road improvement projects going on, motorists travelling to and from Williams AFB may feel they have experienced a driving obstacle course.

continued

This is an all too common sight to military members and civilian employees at Williams AFB when travelling to work each morning. Most arrive via Power Road and must negotiate the light at Williams Field Road to enter the base. The reverse is also true when going home in the evening.

Arizona's Department of Transportation has developed a remote-controlled "Dust Warning System" using signs with changeable messages to warn motorists travelling the more vulnerable freeway areas between Phoenix and Tucson.

Here are some driving tips that may help you in dealing with a dust storm:

— Reduce speed and turn driving lights on.

— If visibility is less than 300 feet, pull off the roadway and turn off your headlights. DO NOT STOP on the traveled portion of the roadway. Wait until visibility is at least 300 feet again before reentering the roadway.

— Remember to turn off your lights when you leave the road because if other vehicles see your taillights they may follow them and run into your parked car.

Rapid growth and development of local communities have forced road widening projects such as the one above on several of the main access roads to the base.

DRIVING LAWS ARE CLEAR

One last thing about driving on and around Williams AFB. While some leeway may be granted by law enforcement officials to motorists traveling high speed interstate highways in Arizona, such is not the case on base or in the local communities. Speed limits in cities and residential areas are strictly enforced. In addition, wearing seat belts is mandatory for any motorist expecting to enter the base.

Arizona has some of the most stringent driving safety laws anywhere. Two of these to keep in mind are the mandatory use of an adequate child restraint device for all infant passengers, five years old and younger, and that driving under the influence of alcohol will not be tolerated. Failure to adhere to either law can mean a stiff fine, but driving under the influence of alcohol can also mean loss of your driver's license and a jail term. For a military member the punishment can be much more severe, such as a termination of your military service.

GARDEN OF EDEN

The Valley of the Sun is considered by many thousands of people to be as close to a "Garden of Eden" as there can be found anywhere on earth. Driving the streets and highways of Arizona's most populated region can be extremely pleasurable as long as your approach is tempered with common sense, good judgment and a healthy respect for the law.

How do you spell rescue?

by SSgt. JOHN MULLEN
NCOIC, Winter Survival
U.S. Air Force Academy

As more people pack their hunting and camping gear and venture into the wilds, chances are some will become lost.

The ability to use a variety of signaling devices can mean the difference between a speedy rescue and a prolonged survival emergency.

Signaling is nothing more than drawing attention to yourself. Signal mirrors have been responsible for more rescues than any other signaling device, and can be used even on cloudy days. Mirrors from vehicles may be used, as well as any reflective surface, including polished metal, coins, aluminum foil or glass. Practice scanning the horizon with a mirror before an emergency. It is important to be able to direct the reflection 360 degrees.

If you are stranded in your vehicle, in addition to mirrors the horn or CB radio can be used to draw attention to your location. The effectiveness of using a car as a signal can be increased by draping a brightly-colored material over the car. Road flares are also excellent signaling devices. Commercial signal flares may be purchased at most camping outfitters.

Many stores also carry rifle and pistol cartridges specially loaded with pyroforic materials designed to act as signal flares. Three shots from a firearm or three blasts of a whistle is considered a distress signal.

Ground-to-air signals are effective in open areas. When constructing such a signal, try to find an area that will afford 360 degrees visibility from the air. The signal should contrast sharply with the surroundings and should appear man-made. The letters "SOS" may be tramped out in an open, snow-covered field, or fashioned from tree boughs, brush or logs. The signal should be made as large as time and materials will allow. A good rule is to have letters in the signal at least three feet wide and 18 feet long.

Another signal would be an arrow on the ground indicating the direction to the person in distress.

Other signals that are recognized internationally as distress signals are:

X — Requires medical attention
V — Requires assistance
Y — Yes
N — No

Fire and smoke are also good signals. Three fires at night, spaced in a triangular shape or smoke during the day can be used. White smoke is most effective when there is no snow. White smoke can be produced by placing evergreen boughs, moist vegetation or wet, punky wood on a fire. Black smoke should be used when there is snow, and can be produced by burning petroleum products, tires or foam from a car seat.

The ability to signal effectively is your responsibility. If you have told family members or friends where you are going, someone will be looking for you if your return is overdue.

SHOCK ABSORBERS

(top left)
Before you do any mechanic's work you should remove watches, rings, bracelets and other jewelry. Also avoid wearing neckties or loose clothing, and tie up your hair if it is long.

(left)
Chock the wheels, set the parking brake and put the transmission in neutral (automatic in park) before lifting the car off the ground.

(top)
Always read your vehicle's shop manual section about the job at hand before beginning. That includes the section on lifting points for the jack.

How do you tell if you need new shock absorbers? If you use the old jumping on the bumper trick you'll never know until it's far too late.

It used to be that you tested shocks by jumping up and down on the bumper or, if you were strong enough, bouncing the car by pushing on the fenders. If when you stopped jumping or pushing the car it stopped its motion almost instantly, or at least within a single cycle, the shocks were OK.

Today's shock absorbers don't respond to this old test. They're intended for controlling motion at medium to high speeds. About the best motion you can simulate by your jumping or pushing is two miles per hour which is well below the shocks' active speed.

Only a hard road test will tell you for sure if your shocks need replacement. If the car won't hold a steady path when cornering hard or it shakes, rattles and rolls on a washboard road, the odds are the shock absorbers are worn out.

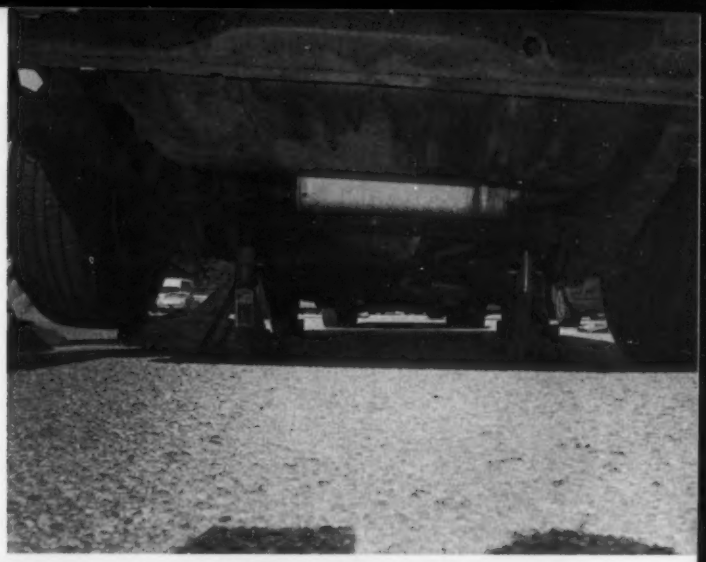
As a double-check on the shocks' condition, tap the brakes several times while driving on smooth pavement at about 10 mph. If the car starts rolling like a rocking horse, the shocks are shot.

As a point of reference, the original equipment shocks on most new cars should be replaced between 12,000 to 15,000 miles. Seldom are original equipment shock absorbers good for more than 20,000 miles.

Shocks are important to your safety because they control the up and down motions of the wheels keeping the tires in touch with the road surface. Worn shocks can actually allow the tire to lose contact with the road, adversely affecting cornering, acceleration and braking.

While the car's springs absorb road shocks, the shock absorbers control and

Use a jack that is rated for the load to be lifted.



Don't crawl under any vehicle until it is safely supported by jack stands rated for the load they have to hold.

A quick inspection of the shocks may make removal easier. While you're at it, spray the nuts and bolts that have to be removed with a penetrating oil.

To remove a shock, first remove the top nut. In the case of this upside down mounted rear shock, the top nut is the bottom nut, OK?

damp the springs' oscillations. Shocks work by friction. They convert the energy imparted to the springs into thermal energy and then dissipate the heat into the air or the chassis.

Most modern cars use tubular-shaped, telescoping hydraulic shocks. In the case of most front-wheel-drive designs, the front shock absorbers are part of the MacPherson struts as are the coil springs. Similar struts on the rear suspension of a vehicle are called Chapman struts.

You should always replace worn original equipment shock absorbers with premium units. This is especially true the heavier you load your car and/or the harder you drive it. Even if your springs look good, they will have lost some of their bounce which a good quality shock absorber can compensate for. In fact there are shock absorbers with added coil springs around them that can help with loading problems.

Super-premium shock absorbers are good investments for newer, low mileage cars. These higher-priced units — whether they are adjustable or gas-shocks or what-have-you — can last for 100,000 miles or more. In fact, the adjustable models permit you to adjust them for wear. Such units usually have a nicely finished piston rod, better sealing, more sophisticated valving, etc.

However, the most important thing to remember when buying new shocks is to get the correct size for your make and model of car. There's nothing more frus-

continued

Instead of mounting through the steel floor, this upside down mounted rear shock is bolted to the floor.

In many cases it is easier to get at the shock mounts if you first remove the wheels.

trating than getting your old shock absorbers off only to find out that the replacements are too long or short.

You can make the job a lot easier by reading the section on shock absorbers in a shop manual for your specific vehicle before tackling the project.

The critical part of changing shock absorbers is the same as it is for any work done under a vehicle: Making sure the vehicle doesn't move while you're under it. Having a car, even if it weighs less than 2000 pounds, fall on you is a shock your body won't quickly absorb.

After you have set the emergency brake, block both sides of the wheels that will remain on the ground when the other end is jacked up. Then it would be wise for you to roll the car's windows up, lock the doors and hide the keys. That way you'll have no surprise visitors causing you additional problems.

Once the vehicle is jacked up, don't get under it until jack stands have been securely placed.

It'll be easier to remove the old shocks if you take the time to inspect the mounts first. Then while you're looking at how the shocks are fastened to the vehicle, spray each bolt and nut with a penetrating oil to make it easier to remove.

At this point you may want to consult your vehicle's shop manual again to confirm what your inspection has revealed. For example, wouldn't it be easier to reach the upper shock mounts if the wheels were removed?

Like everything else, new shocks usually come with instructions. Read them.

New shocks also come with new bushings. Install them exactly as the old bushings and washers were when you removed the old shocks. You did take notes, didn't you?

Generally, the rear shock absorbers are easier to remove and install because there is more room around them in which to work.

Although there are numerous variations, rear shocks are usually attached to a bracket on the top or bottom of the leaf spring, to a bracket on the ends of the axle housing or to a web plate on the side of the leaf spring. The top of the shock usually then extends through the steel floor of the vehicle into the trunk.

One of the more common rear shock absorber variations seen today has the shock turned upside down with the bottom (now the top) bolted to a plate in the vehicle's floor.

Front shock absorbers are mounted similarly to the rear units. While some front shocks are inside the suspension's coil spring, others are mounted in front of, behind or to the side of the coil spring.

The top of the front shock usually attaches to the vehicle's frame or extends through a plate attached to the top of the coil spring. Sometimes there is a bolt holding the bottom of the shock to the mounting plate on the lower A-frame arm. At other times there is a very large washer used to hold the bottom of the shock to the A-frame or the bottom of the coil spring.

To remove a shock absorber, simply remove the top nut and lift off the washers and rubber bushings. Be sure to note the order in which all washers, grommets, bushings and other small parts are taken off, so that they can be put back on in reverse order when installing the new shocks.

You might want to use one of the better commercial memory devices on the market today to help you remember the order: pencil and paper.

Then all you have to do is remove the bolt(s) that secure the bottom of the shock and remove the unit. Sometimes a mounting plate may have to be removed to allow the actual removal of the shock.

In the case of those upside down rear shocks, you still remove the top nut (which is now on the bottom) first.

Note that shock absorbers are being talked about here, not MacPherson struts. A special tool is necessary to hold the coil spring when a MacPherson strut is worked on. While it may not be necessary in all cases to have the special coil holder when the strut is removed, you'll have to have the special tool to remove the coil from the strut in order to replace the strut or the shock absorber in those units with replaceable shocks.

Consult your vehicle's shop manual before attempting any strut work to ensure that you not only have the necessary tools but also the proper skills required to do the job safely.

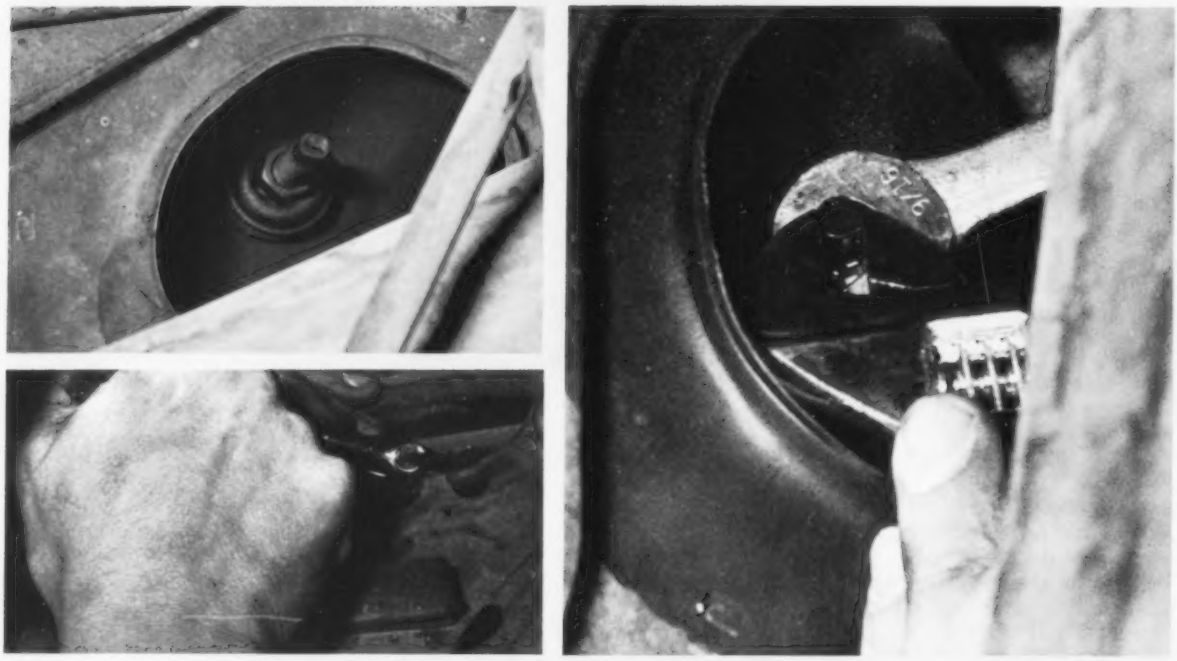
The new shocks are first fitted into place loosely and then the top end is secured. Be sure to use new bushings that should come with the new shock absorbers. Once the top of the shock is fastened, the bottom can be tightened. Be sure before tightening that all the plates, bushings, washers, lock washers, bolts, nuts and locking nuts have been replaced in their proper order.

Loosely fit the new shock in place . . .

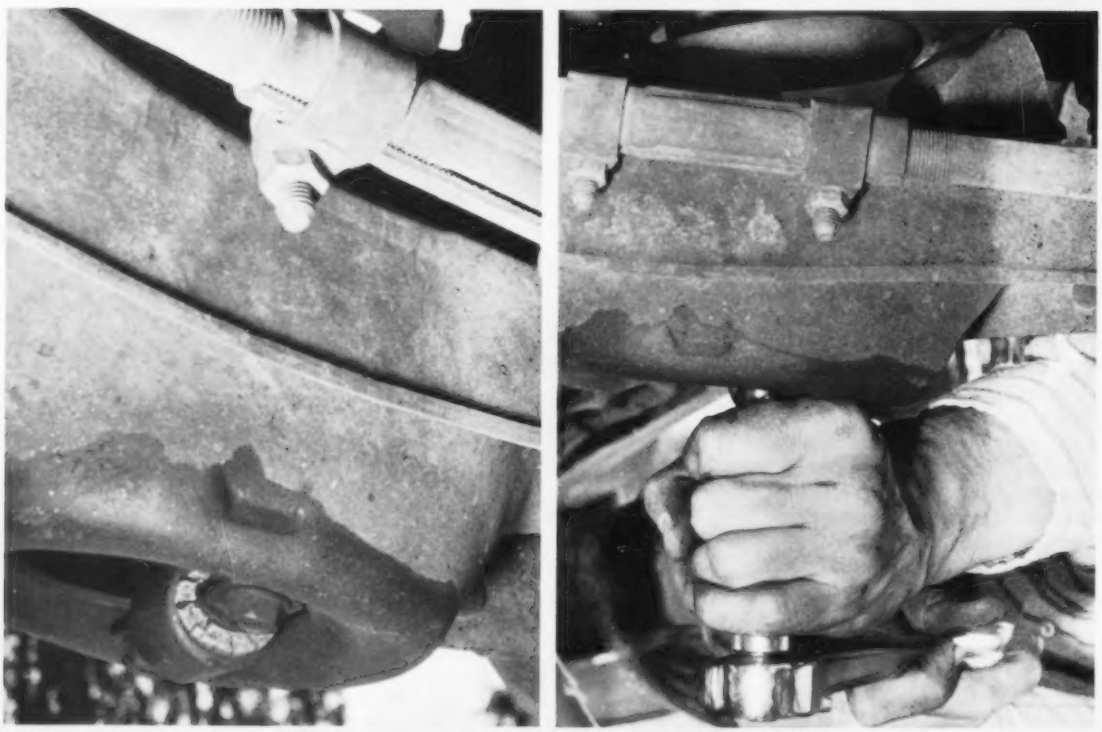
. . . and with the new bushings and washers in place . . .

. . . secure the new shock absorber in place.

continued



Sometimes getting to the upper mounting of a front shock is not easy.

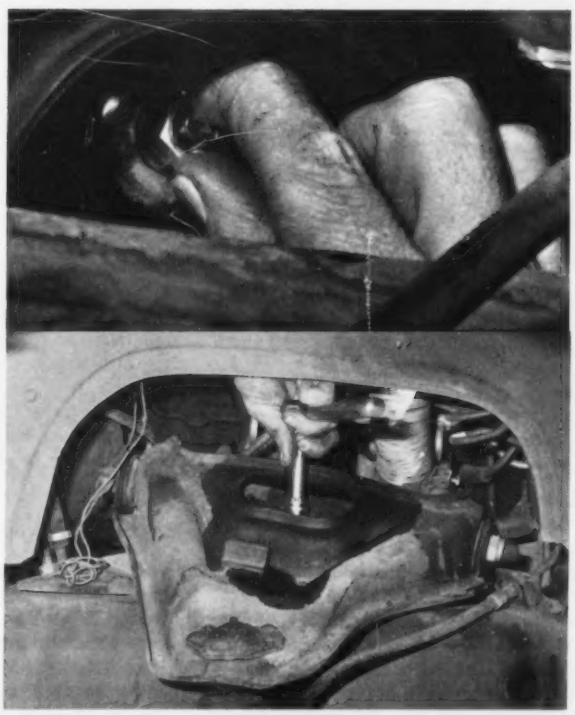


The lower mount of a front shock looks easy to get at on the bottom of the A-frame, with the shock running up through the center of the coil spring.

Once the front shock mounts have been disconnected you simply remove it from the coil spring.

Carefully push the new shock absorber into place. Note the use of safety goggles.

You often have to extend the new shocks their full length before installing.



You'll find the shock easier to secure than it was to loosen.

TRUE ACCIDENTS

Following are a few reports of accidents involving Air Force members. We have removed names and references to dates and places.

IMPROPER TURN

Two airmen were riding south on a motorcycle on a four-lane road. A northbound pickup truck tried to make a left turn at an intersection, and collided almost head-on with the motorcycle. The driver of the motorcycle received severe head injuries. He died during surgery. The passenger received a broken arm and a sprained ankle.

HOT RODDING

Two Air Force members had just driven out the gate of an overseas base on a two-lane road. The driver told his passenger this was his favorite stretch of road. About half a mile outside the gate, the driver began to accelerate rapidly. They were traveling so fast that the car became airborne as they came over the crest of a hill. They hit the pavement and the driver tried to brake and downshift when he saw an oncoming vehicle. His car skidded sideways and the other vehicle crashed into the driver's door. His injuries were so critical he was transferred to a stateside hospital three days later. He died two days after that. Although no alcohol test was made because of the severity of his injuries, beer bottles and a partially empty wine bottle were found in his car.

HOT ASPHALT

A long line of cars was following a southbound tractor-trailer truck on a two-lane highway. One car contained an Air Force sergeant and his mother-in-law. All the vehicles were traveling at 50-55 mph. The last car in line pulled out and began to pass the entire line of cars. After he had passed six cars, the driver realized he did not have enough time to complete the pass before he reached an oncoming tractor-trailer truck that was hauling hot asphalt. The car and the asphalt truck collided, causing the left front tire of the asphalt truck to blow out. The asphalt truck veered out of control across the southbound lane and overturned off the shoulder on top of the sergeant's car and another vehicle. The member's car was crushed and hot asphalt spilled into the car, killing him and his mother-in-law. The driver of the other vehicle was killed when the asphalt covered him and his car.

HIGH SPEED

Three Air Force members were riding their motorcycles at a lake 30 miles away from their base. As they were leaving to go back, one of them removed his helmet and took off at high speed, estimated by his friends at over 100 mph. He tried to pass a vehicle on a right hand curve, but lost control. The motorcycle went off the road and crashed into a ravine. The member was killed.

HIGH ALCOHOL LEVEL

A sergeant left the NCO club just after midnight and had a minor accident on his motorcycle. His Blood Alcohol Level (BAL) tested at .283. He was released to his first sergeant, who took him home. About 0600, he was taken in for drunkenness and disorderly conduct. Again he was released to his first sergeant. The first sergeant told him to go to bed and not leave again. About 0130 the next day, the sergeant was riding his motorcycle east in the westbound lanes of a four-lane divided highway when he hit a car head-on. He died of massive internal injuries. His BAL was .361.

DOG

A sergeant was riding his motorcycle on a two-lane road a few miles from his base at 1950 hours. A large dog ran from between two parked cars into the sergeant's path. The motorcycle hit the dog and the sergeant was thrown off and very seriously injured. He died 36 days later.

ALCOHOL AND ANGER

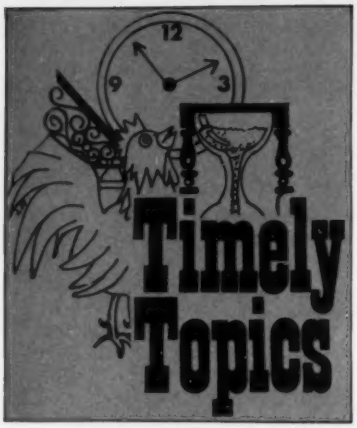
A sergeant left his on-base housing just after midnight, angry and under the influence of alcohol. He had driven his automobile about half a mile on a base street at high speed when he lost control on a right hand curve. The car crossed the center line, went off the road and hit a tree and a power pole. The car was destroyed and the member, who had not worn his seat belt, suffered massive injuries. He died three days later in the hospital.

CYCLE/TRUCK

Two Air Force members were riding a motorcycle on a highway at 55 mph. As they passed a convenience store, a pickup pulled out of the store parking lot directly into their path. The motorcycle hit the left front fender of the pickup. The passenger of the motorcycle was thrown over the driver and the pickup and hit the road about 100 feet away. He was treated at a local hospital, but because of the severity of his injuries the hospital authorities decided to transfer him to a larger facility. He died on the way there. The operator was also thrown from the motorcycle and was hospitalized with critical injuries.

FATIGUE/SPEED

A sergeant had breakfast at the dining facility at his overseas base after working from 2000 to 0800. He left for his residence about 0845 and his roommate saw him sleeping about 1030. At 1300 he left for a friend's house to have lunch, and he returned to his residence at 1500 to work on his motorcycle. From 1700 to 1900 he was at a recreation area; then he went to town and filled his motorcycle with gasoline. He left the town following a car on a narrow, winding, hilly road with very few straightaways to use in safely passing another vehicle. When he came to a slight downhill straightaway he passed the car, which was traveling about 70 kilometers per hour (43 mph). After passing the car, he entered a slow, sweeping, downhill bend to the left. Instead of taking the curve, he went in a straight line, off the road. The motorcycle hit a stone wall and the sergeant was thrown back into the roadway. He struck his head and died. The investigator determined that the sergeant was fatigued and that he probably froze when he entered the curve. He estimated the sergeant's speed at over 80 mph. The sergeant had fastened his helmet to the strap of a suitcase on the rear of the motorcycle instead of wearing it.



AUTO LIGHTING REGULATIONS

The National Highway Traffic Safety Administration (NHTSA) has modified automobile lighting performance requirements to make them more compatible with European standards. Amendments to the current standard are expected to ease certification procedures and lift some barriers to international trade.

NHTSA Administrator Diane K. Steed said, "Costly differences in regulatory requirements are not justified when safety considerations are not involved.

"Progress toward harmonization of American and European lighting standards will help lower the cost to the consumer as well as enhance the auto industry's ability to compete in the world market."

The modifications include:

- changes in the allowable brightness of yellow rear turn signals to enable the use of common bulbs for these lights in both U.S. and European cars;
- new guidelines for measuring brightness of stop, tail, turn signal and parking lamps so that similar procedures may be used here and in Europe.
- lowering the minimum permitted mounting heights of headlamps.

In addition, the amendment calls for adoption of the latest Society of Automotive Engineers' standard for license plate lamps which brings the U.S. standard into agreement with the European standard.

A-BODY AXLES

The Department of Transportation has reached an agreement with General Motors for the inspection of rear axles on roughly 3.1 million GM "A-body" automobiles and for remedies where needed.

A-Body automobiles include Chevrolet Malibu, Monte Carlo and El Camino; Pontiac LeMans and Grand Prix; Oldsmobile Cutlass and Cutlass Supreme; Buick Century and Regal; and GMC Caballero.

In April 1983, the Department's National Highway Traffic Safety Administration (NHTSA) made an initial determination that a safety-related defect exists in certain A-body cars manufactured by GM during model year 1978, 1979 and 1980. NHTSA determined that the rear-axle shafts on some of those vehicles had thin end-buttons, and that the condition could result in disengagement or separation of the axle shaft and wheel assembly from the vehicle.

Under this agreement, GM will notify all owners of these vehicles of NHTSA's concerns regarding the possibility of rear-axle shaft separation. GM has also agreed to have its dealers inspect the vehicles to determine if the axle problem exists and to replace parts or make other repairs as appropriate. Both the inspection and any remedy will be performed at GM's expense, with no charge to the vehicle owner.

SPEED LIMITS AND CATALYTIC CONVERTER

Mandatory installation of catalytic converters on cars in West Germany proposed for new cars in 1986 has been postponed until January 1989. Introduction of unleaded gasoline and the catalytic converters — along with speed limits of 62 miles-per-hour on autobahn freeways and 50 miles-per-hour on secondary roads — has been proposed to reduce damage to West Germany's forests.

COMPUTER TO AID DRIVERS, MECHANICS

In the automobile of the future, the computer of the future will be harnessed to do instantaneously what car mechanics now do in a tune-up, according to Stanford University Prof. J. David Powell.

Powell, who has spent most of his career researching power systems and how to make them more efficient, is convinced that the days of a car owner trying to explain to a mechanic the odd noise or malfunction under the hood will soon be over.

"Before long," Powell is now telling his students, "the computer in one's car will be hooked up to a more sophisticated computer in the repair garage. A microprocessor will speak expertise to another microprocessor. And between them, the fault in the vehicle will be identified without any guesswork.

"Most of the new U.S. cars already have microprocessors that can identify some major problems," Powell said. "These computers will improve steadily."

Powell, a professor at Stanford in both aeronautics/astronautics and mechanical engineering, shares the average vehicle owner's conviction that the present situation in auto repair is "largely hit or miss." A number of garages may each give widely differing diagnoses and prices for locating and repairing a car's troubles. (AUTOMOTIVE NEWS)

DIFFERENT ATTITUDE CAN SAVE DOLLARS

What's the difference between maintenance and repair?

It can be as simple as the amount of money spent and the absence of unhappiness. In automotive terms, it's a tune-up.

Actually, says the Automotive Information Council (AIC), that's a little unfair since a tune-up is maintenance. But it's no more unfair than calling a tune-up a repair.

Repair is what you do when something is broken. Maintenance is what you do to keep something from breaking.

"Probably if more motorists thought of a tune-up in terms of maintaining their vehicles (which is what they would be doing) instead of thinking of it in terms of a repair (which it is not) there would be an entirely different attitude about spending money for a tune-up," says AIC.

While today's vehicles don't need the same amount of attention as previous cars, motor vehicles are not maintenance free — even if many motorists treat them as if they were.

Just more than 66 percent of the cars on the road in 1983 received a tune-up. While this is up slightly from 1982, it's a far cry from the more than 79 percent tuned up in 1970.

The owner of a 1905 Pierce Motorette couldn't afford a case of service apathy. The Motorette required an oil change every 15 miles.

A popular book in the early days of motoring called *Diseases of the Gasolene Automobile and How to Cure Them*, had this advice on servicing: "When you buy an automobile, there is formed an unwritten agreement between you and the machine. You expect to receive certain benefits. It, likewise, exacts a penalty from you in direct proportion to your own demands."

It's still good advice, says AIC.

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A PAIN IN THE NECK

It usually starts with a relatively minor tap to your rear bumper. There's little damage, a police report has been filed and you and the other driver have exchanged information such as names of insurance companies. A couple of hours later you notice that your neck is stiff and sore.

Why?

Whiplash is the answer.

Although it seems to be a relatively minor pain in the neck, it can be a serious injury. But more importantly, it can be avoided or at least made less severe by properly adjusting your vehicle's head rests.

Before Jan. 1, 1969, when all passenger cars were required to have head restraints, more than 400,000 people a year suffered whiplash injuries when rear-end crash forces jerked their heads backward past the tops of the seat-backs. Today seats are designed with either adjustable restraints (which are attached to the seat-back and can be moved up or down) or integral restraints (which are fixed height and designed to be a part of the seat-back).

According to a National Highway Traffic Safety Administration report, properly adjusted head restraints tend to reduce overall injury risk in rear impacts by 13 percent. The report estimates that head restraints prevent approximately 64,000 whiplash injuries a year.

The head restraint should be high enough to reach beyond the top of your neck, that is, up to the skull. Only then can it do its job. However, head restraints cannot be completely effective without backup protection. They must be used in cooperation with properly worn safety belts.

A properly adjusted head restraint in combination with lap and shoulder belts is the best protection against other drivers becoming a pain in the neck.